

REMARKS/ARGUMENTS

The present Amendment is in response to the Office Action having a mailing date of September 29, 2005. Claims 1-20 are pending in the present Application. Applicant has amended claims 1, 6, 11, and 17. Applicant has also canceled claims 4-5 and 12-13. Consequently, claims 1-3, 6-11, and 14-20 remain pending in the present Application.

Applicant has amended claims 1, 11, and 17 to recite that the use of first and second antiferromagnetic layers having different blocking temperatures. Claims 1, 11, and 17 have been further amended to recite that one of the antiferromagnetic layers has a high blocking temperature, while the other has a low blocking temperature. Support for the amendment can be found in the specification, paragraphs 25-27. Applicant further notes that the low and high blocking temperatures are defined in the specification with respect to materials having a relatively low blocking temperature such as IrMn, FrMnRh or FeMn and having a relatively high blocking temperature, such as PtMn or PtPdMn. See, for example, specification, paragraphs 25-27. Applicant has also amended claim 6 to recite that the third nonferromagnetic layer adjoins the first and fourth ferromagnetic layers. Support for the amendment can be found in the specification, paragraphs 16-17 (particularly the last 3 lines of paragraph 16 and paragraph 17 in its entirety). Accordingly, Applicant respectfully submits that no new matter is added.

In the above-identified Office Action, the Examiner rejected claims 6, 7, 9, and 17-20 under 35 U.S.C. § 112, first paragraph. The Examiner drew Applicant's attention to the rejection in the Office Action of December 26, 2002. This rejection noted that the claims "contain reference to a third non-magnetic layer and/or a fourth ferromagnetic layer, yet the specification never describes a fourth ferromagnetic layer being present."

Applicant respectfully traverses the Examiner's rejection. The specification states, in paragraph 16, that the "pinning structure 102 may include a permanent or hard magnetic layer, an antiferromagnetic layer, or a *synthetic antiferromagnetic structure* that adjoins a hard magnetic layer or antiferromagnetic layer." Furthermore, paragraph 17 describes one synthetic antiferromagnetic structure as including "a pair of ferromagnetic layers sandwiched about a nonferromagnetic layer, such as a very thin exchange coupling layer of ruthenium (Ru), iridium (Ir) or rhodium (Rh)." See also, paragraph 22 (describing formation of structures including a synthetic antiferromagnetic structure). With respect to claim 9, Applicant notes that after describing formation of a synthetic antiferromagnetic structure, the specifications states that the pinned layer, the conductive spacer layer and the free layer may be formed using "similar techniques." Specification, paragraph 22. Consequently, the specification does describe at least a fourth ferromagnetic layer and at least a third non-ferromagnetic layer as part of the pinning structure. Accordingly, Applicant respectfully submits that claims 6, 7, 9, and 17-20 are supported by the specification.

The Examiner also rejected claims 1-5 and 8-17 under 35 U.S.C. § 102 as being anticipated by WO 2001-03130A1 or U.S. Patent No. 6,501,627 (Noma). In rejecting claims 4-5, the Examiner cited Figure 4, elements 13 and 19A and col. 12, lines 23-29.

Applicant respectfully traverses the Examiner's rejection. Independent claims 1, 11, and 17 all recite the use of first and second ferromagnetic layers, which have different blocking temperatures. Claims 1, 11, and 17 further recite that one of the first and second antiferromagnetic layers has a low blocking temperature, while another of the first and second antiferromagnetic layers has a high blocking temperature. Because one antiferromagnetic layer has a low blocking temperature while the other has a high blocking temperature, it is possible to set the different

orientations of the first and second ferromagnetic layers in a single annealing step. See specification, paragraphs 25-27.

In contrast, Noma fails to teach or suggest a sensor in which one of the first and second antiferromagnetic layers has a low blocking temperature, while another of the first and second antiferromagnetic layers has a high blocking temperature. Noma merely states that “for the first antiferromagnetic layers 19A and 19B and the second antiferromagnetic layer 1, it is preferable that at least one of them should have a Neel temperature of 300.degree. C. or over.” Noma, col. 12, lines 25-29. Consequently, it is possible that both of the antiferromagnetic layers have the same blocking temperature, both of which are over three hundred degrees Celsius. Based on the disclosure of Noma, it might be possible that the two antiferromagnetic layers have different Neel temperatures. However, based on the cited teaching of Noma, one antiferromagnetic layer might have a Neel temperature of two hundred ninety-nine degrees Celsius, while the other might have a Neel temperature of three hundred and one degrees Celsius. Consequently, there is no indication in Noma that the Neel temperature of one antiferromagnetic layer would be low with respect to the Neel temperature of the other antiferromagnetic layer. Noma, therefore, fails to teach or suggest the sensors recited in independent claims 1, 11, and 17. Accordingly, Applicant respectfully submits that claims 1, 11, and 17 are allowable over Noma.

Claims 2-3 and 8-10 depend upon independent claim 1. Claims 14-15 depend upon independent claim 11. Consequently, the arguments herein apply with full force to claims 2-3, 8-10, and 14-15. Accordingly, Applicant respectfully submits that claims 2-3, 8-10, and 14-15 are allowable over Noma.

In the above-identified Office Action, the Examiner also rejected claims 1-4, 6-12, and 14-20 under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 6,462,919 (Mack) as evidenced by U.S. Patent Application Publication No. 2001/0050859 (Schwarzl).

Applicant respectfully traverses the Examiner's rejection. As discussed above, independent claims 1, 11, and 17 all recite the use of first and second ferromagnetic layers, which have different blocking temperatures. Claims 1, 11, and 17 further recite that one of the first and second antiferromagnetic layers has a low blocking temperature, while the other of the first and second antiferromagnetic layers has a high blocking temperature.

In contrast, Applicant can find no mention in Mack of the antiferromagnetic layers having different blocking temperatures. Mack does describe a sensor utilizing exchange biasing of the free layer. Mack, col. 4, lines 21-39. However, Applicant can find no mention in Mack of the first and second antiferromagnetic layers that bias the free layer and pinned layer having different blocking temperatures. Moreover, Applicant can find no mention in Mack of one of the antiferromagnetic layers having a low blocking temperature while the other has a high blocking temperature. Consequently, Mack fails to teach or suggest the sensors recited in independent claims 1, 11, and 17. Accordingly, Applicant respectfully submits that claims 1, 11, and 17 are allowable over the cited references.

Claims 2-3 and 6-10 depend upon independent claim 1. Claims 12 and 14-16 depend upon independent claim 11. Claims 18-20 depend upon independent claim 17. Consequently, the arguments herein apply with full force to claims 2-3, 6-10, 12, 14-16, and 18-20. Accordingly, Applicant respectfully submits that claims 2-3, 6-10, 12, 14-16, and 18-20 are allowable over the cited references.

The Examiner also rejected claims 5 and 13 under 35 U.S.C. § 103 as being unpatentable over Mack in view of U.S. Patent Application No. 2004/0136122 (Beach).

Although claims 5 and 13 have been canceled, Applicant respectfully traverses a rejection of claims 1-3, 6-11, and 14-20 under Mack in view of Beach. As discussed above, Mack fails to teach or suggest one of the first and second antiferromagnetic layers having a low blocking temperature, while the other of the first and second antiferromagnetic layers has a high blocking temperature.

Beach fails to remedy the defects of Mack. Applicant has provided herewith an Affidavit under 37 C.F.R. 1.131, indicating that the present application has an invention date before the priority date of Beach. Consequently, without more, Beach is unavailable for use as a reference. Moreover, even if Beach is considered to represent the state of the art at the time of the filing of Beach, this date is after the invention date of the present invention. Accordingly, Applicant respectfully submits that claims 1-3, 6-11, and 14-20 are allowable over the remaining cited references.

Applicant's attorney believes that this application is in condition for allowance. Should any unresolved issues remain, Examiner is invited to call Applicant's attorney at the telephone number indicated below.

Respectfully submitted,

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Date

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